

EVIDENCE OF TRANSFER OF PHOTOSYNTHATE FROM A RED ALGAL MACROPHYTE TO ITS SYMBIOTIC SPONGE.

Memoirs of the Queensland Museum 44: 204. 1999:- Symbiotic cyanobacteria are quite common in coral reef sponges providing much of the sponge's supply of carbon. There are also several sponge species with macroalgal symbionts. In these sponges, the role of the algae is unknown. One of these symbioses is that of the sponge, *Haliclona cymiformis* (Haplosclerida) and the red alga, *Ceratodictyon spongiosum* (Rhodymeniales) which is common in the shallow tropical waters of fringing reefs of the Indo-Pacific region. The sponge tissue comprises about one third of the dry weight of the association and grows over the external surface of the alga and between the algal branchlets. In the field, the alga is dark green to purple with thick branches of tightly anastomosed (fused) branchlets. However, in culture, the branchlets are red and thin and do not fuse. Neither symbiont has been found growing separately in nature suggesting that the symbiosis is obligate. The physiological basis of this well integrated association is not yet known.

The sponge obtains nutrients from the water column in the form of dissolved and particulate organic matter at rates that are similar to those of free-living sponges (Trautman, 1997). We have found that some photosynthate is transferred from the alga to the sponge, in a time-dependent manner. After 1h incubation in the light with $\text{Na}_2^{14}\text{CO}_3$ the amount of photosynthetically fixed carbon transferred to the sponge (range 22.77- 48.3nmol carbon/mg dry wt. of sponge) represents 0.6-1.28% of the total carbon fixed by the alga during this period. When the fixed carbon in the sponge tissue is extracted using methanol/chloroform/water (24/10/4 v/v/v), to give an

aqueous-soluble fraction (low molecular weight metabolites) and a chloroform-soluble fraction (lipids, sterols, chlorophyll etc.) followed by extraction in 2 M KOH (high molecular weight metabolites such as proteins, polynucleotides, polysaccharides) 75-88% of the ^{14}C -labelled carbon is found in the aqueous fraction, about 11-20% in the KOH-soluble fraction, 2-3% in the chloroform-soluble fraction and <3% in KOH-insoluble material.

When the aqueous-soluble fraction is further fractionated by ion exchange chromatography into neutral (sugars), basic (amino acids), acidic (organic acids) and phosphate ester fractions, most of the fixed carbon is found in the basic (47%) and neutral (38%) fractions. Some fixed carbon is found in organic acids (14%) with very little in phosphate esters (<2%). Our data suggest that while the alga may supply the sponge with some essential nutrients, the major source of organic carbon is the particulate and dissolved organic matter in the ambient seawater. It may be that the primary role of the algal symbiont is structural rather than nutritional. □ *Porifera, symbiosis, red alga, carbon metabolism, photosynthate, translocation.*

Literature cited.

TRAUTMAN, D. 1997. Aspects of the ecology and physiology of a tropical sponge and its macroalgal symbiont. PhD thesis (Murdoch University: Perth).

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